CLAIMS:

1. A process of producing aluminium and aluminium-containing materials from a solid aluminium-containing feed material that comprises:

(a) leaching the aluminium-containing feed material with a leach liquor and forming an aqueous solution containing aluminium ions;

(b) extracting aluminium ions from the aqueous solution by contacting the aqueous solution with an organic reagent and loading aluminium ions onto the organic reagent and forming an aluminium complex; and

(c) recovering aluminium or an aluminium-containing material from the aluminium complex.

2. The process defined in claim 1 wherein the aluminium-containing material comprises any one or more of alumina, aluminium hydroxide, aluminium trihydrate, and aluminium chloride in any suitable solid form.

3. The process defined in claim 1 or claim 2 wherein the recovery step (c) comprises displacing aluminium ions from the aluminium complex by contacting the aluminium complex with an aqueous solution and thereafter recovering aluminium or an aluminium-containing material.

4. The process defined in claim 3 wherein the solution used in step (c) is a more acidic solution than the initial leach liquor used in step (a) and has limited solubility for aluminium and step (c) comprises displacing aluminium ions from the aluminium complex by precipitating the solid aluminium or aluminium-containing material from the solution.

5. The process defined in claim 4 wherein step (c) comprises recovering the precipitated solid aluminium or aluminium-containing material from the solution.

6. The process defined in claim 3 wherein the solution used in step (c) is an acidic solution and step (c) comprises displacing aluminium ions from the aluminium complex into solution.

7. The process defined in claim 6 wherein the acidic solution is a hydrochloric acid solution.

8. The process defined in claim 7 wherein the hydrochloric acid solution has a pH of 1-6.

9. The process defined in any one of claim 6 to 8 wherein step (c) comprises recovering the solid aluminium or aluminium-containing material from the solution by heating the solution and causing thermal dissociation to drive off water and hydrochloric acid in gaseous forms and produce alumina in a solid form.

10. The process defined in claim 6 wherein step (c) comprises recovering the solid aluminium or aluminium-

containing material from the solution by transferring aluminium ions into an ionic liquid.

11. The process defined in claim 10 comprises recovering aluminium from the ionic liquid.

12. The process defined in claim 11 comprises recovering aluminium from the ionic liquid by applying a potential across an anode and a cathode positioned so that at least the cathode is in contact with the ionic liquid and depositing aluminium on the cathode.

13. The process defined in any one of claims 10 to 12 comprises transferring aluminium ions into the ionic liquid directly from the solution.

14. The process defined in claim 13 wherein the ionic liquid is hydrophobic with a high affinity for aluminium and is stable in the presence of water.

15. The process defined in any one of claims 10 to 12 comprises transferring aluminium ions into the ionic liquid indirectly from the solution.

16. The process defined in claim 15 comprises transferring aluminium ions from the solution contained in one compartment into the ionic liquid contained in another compartment via a membrane, diaphram or other suitable means that is permeable to aluminium ions and separates the compartments.

17. The process defined in claim 16 wherein the driving force for the transfer of aluminium ions from the

compartment containing the solution to the other compartment containing the ionic liquid is either by concentration gradient or by having an anode in the aqueous compartment and a cathode in the ionic liquid compartment.

18. The process defined in claim 3 wherein step (c) comprises displacing aluminium ions from the aluminium complex by precipitating solid material, dissolving precipitated solid material in an ionic liquid directly or indirectly, and recovering the solid aluminium or aluminium-containing material from the ionic liquid.

19. The process defined in claim 3 wherein step (c) comprises displacing the aluminium ions directly from the aluminium complex by transferring aluminium ions into an ionic liquid and recovering aluminium from the ionic liquid.

20. An aluminium or aluminium-containing material produced by the process defined in any one of the preceding claims.